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Title : Communication System for Working Machines

DECLARATION UNDER 37 CFR 1.131

Mail Stop AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Hiroaki TOKAIRIN, hereby declare that:

1. I am employed by Hitachi Construction Machinery Co., Ltd., the assignee of the above-identified patent application as a Manager of the Intellectual Property Department.
2. One of the co-inventors, Hiroshi WATANABE, of the above-identified application submitted a disclosure of the present invention to the Intellectual Property Department of Hitachi Construction Machinery Co., Ltd., prior to May 23, 2000. See Exhibit 1 attached hereto.
3. I diligently prepared and completed a patent application based on the submission received from Mr. Watanabe. That application was filed in the Japanese Patent Office on May 26, 2000. I understand that a certified copy of the Japanese application along with a translation thereof is being submitted to the U.S. Patent and Trademark Office concurrently with this Declaration.

4. It will be noted that Figure 1 of the Exhibit (the figure number is indicated in the upper left-hand corner of the drawing) corresponds to Fig. 1 of the Japanese application which is the same as Fig. 1 of the instant application; Figure 2 of the Exhibit corresponds to Fig. 3 of the Japanese application which is the same as Fig. 3 of the instant application; Figure 3 of the Exhibit corresponds to Fig. 5 of the Japanese application which is the same as Fig. 5 of the instant application; Figure 4 of the Exhibit corresponds to Fig. 6 of the Japanese application which is the same as Fig. 6 of the instant application; and Figure 5 of the Exhibit corresponds to Fig. 7 of the Japanese application which is the same as Fig. 7 of the instant application.

All statements made herein of my own knowledge are true; all statements made herein on information and belief are believed to be true, and further these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

February 15, 2005

Hiroaki Tokairin
Hiroaki Tokairin

①

【発明の名称】 建設機械の情報通信システム

【発明の説明】

- ・建設機械本体にオペレータが任意に操作するスイッチを設ける。（図1）
- ・オペレータがスイッチを操作すると建設機械本体に備えられた通信端末装置は「端末番号」「送信時刻」「スイッチ操作情報」を通信衛星を介して遠隔地にある地上局へ送信する。
- ・地上局は受信した上記情報を公衆回線、またはインターネット等を介してサーバ（日立建機）へ送信する。
- ・サーバでは（図2）
 - 「通信受信部」において地上局から情報を受信
 - 「端末所属会社識別部」において、受信した情報中、端末番号の情報を端末情報データベースと照合し、機械本体の所属する会社を識別する。
 - 「所属会社別メール選択部」において、顧客情報データベースから予め設定されている所属会社のメールアドレス、メール文を読み出す。
 - 「送信メール作成部」において情報の送信元（機種、号機）、受信先（所属会社のメールアドレス）、送信時刻、メール文をまとめて送信メールを作成する。
 - 「メール送信部」は所属会社のメールアドレス先へメールを送信する。
- ・[第2実施例] 機械本体にGPSなどの機械本体位置計測装置を備え、上記スイッチが押されたとき位置情報を付加する。位置情報をメールに盛り込む。（図3,4）
- ・メール文は所属会社からインターネットを介して、指定あるいは作成することができる。（図5）

【目的】

- ・事務所から離れ、携帯電話の使用できない建設現場で稼動する建設機械のオペレータと、その所属する会社の事務所との間で連絡事項を送信したい。
- ・簡単な操作で連絡事項を送信したい。
- ・所属会社毎にシステムを所属会社毎に最適な用途で使用したい。

【作 用】

- ・事務所から離れ、携帯電話の使用できない建設現場で稼動する建設機械と、その所属する会社の事務所との間でオペレータが事務所に連絡したい事項を送信できる。
- ・簡単な操作でオペレータが事務所に連絡したい事項を送信できる。
- ・通信内容（メール文）は所属会社で選択、作成できることから、このシステムを所属会社毎に最適な用途で使用できる。

以上

1

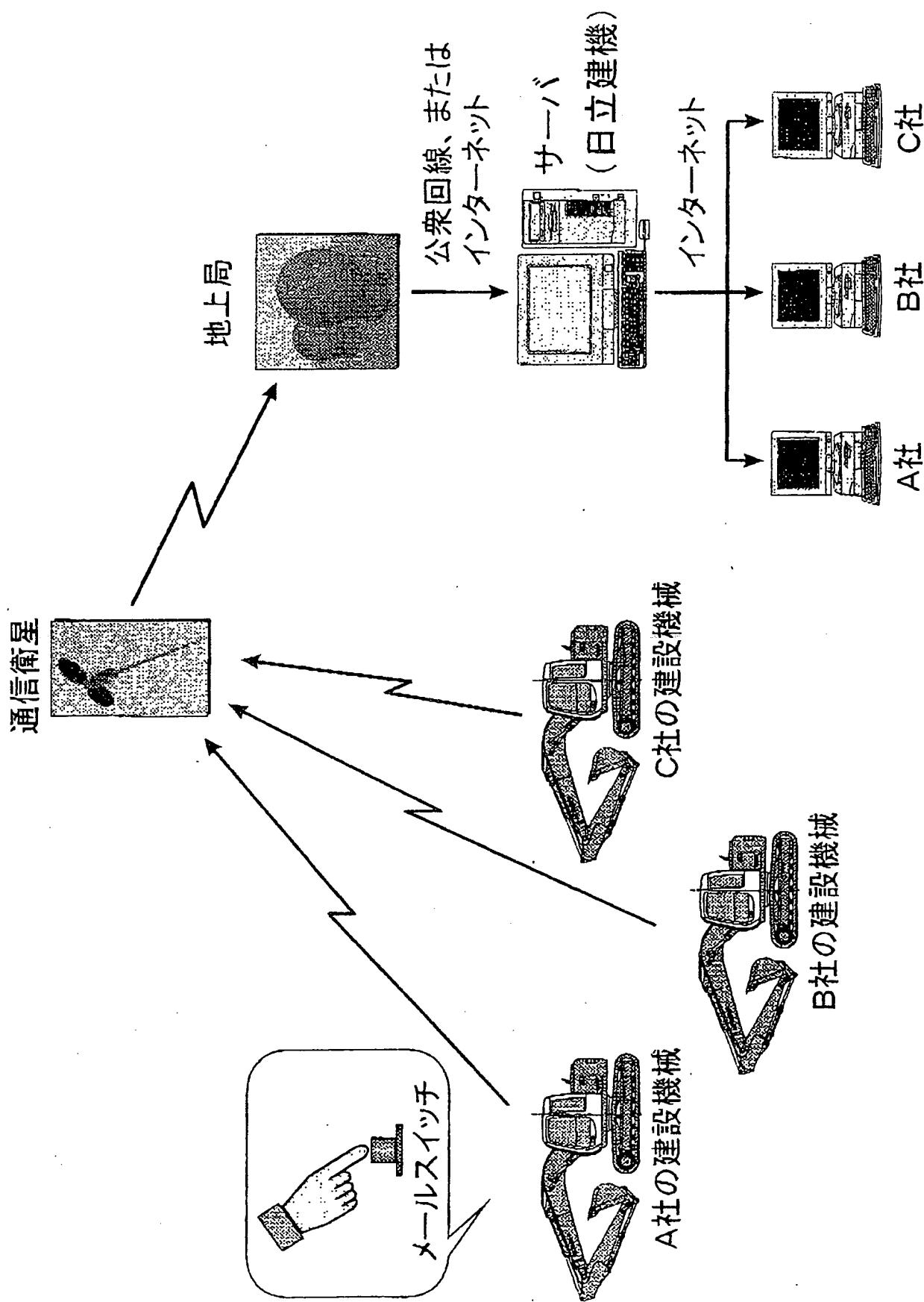
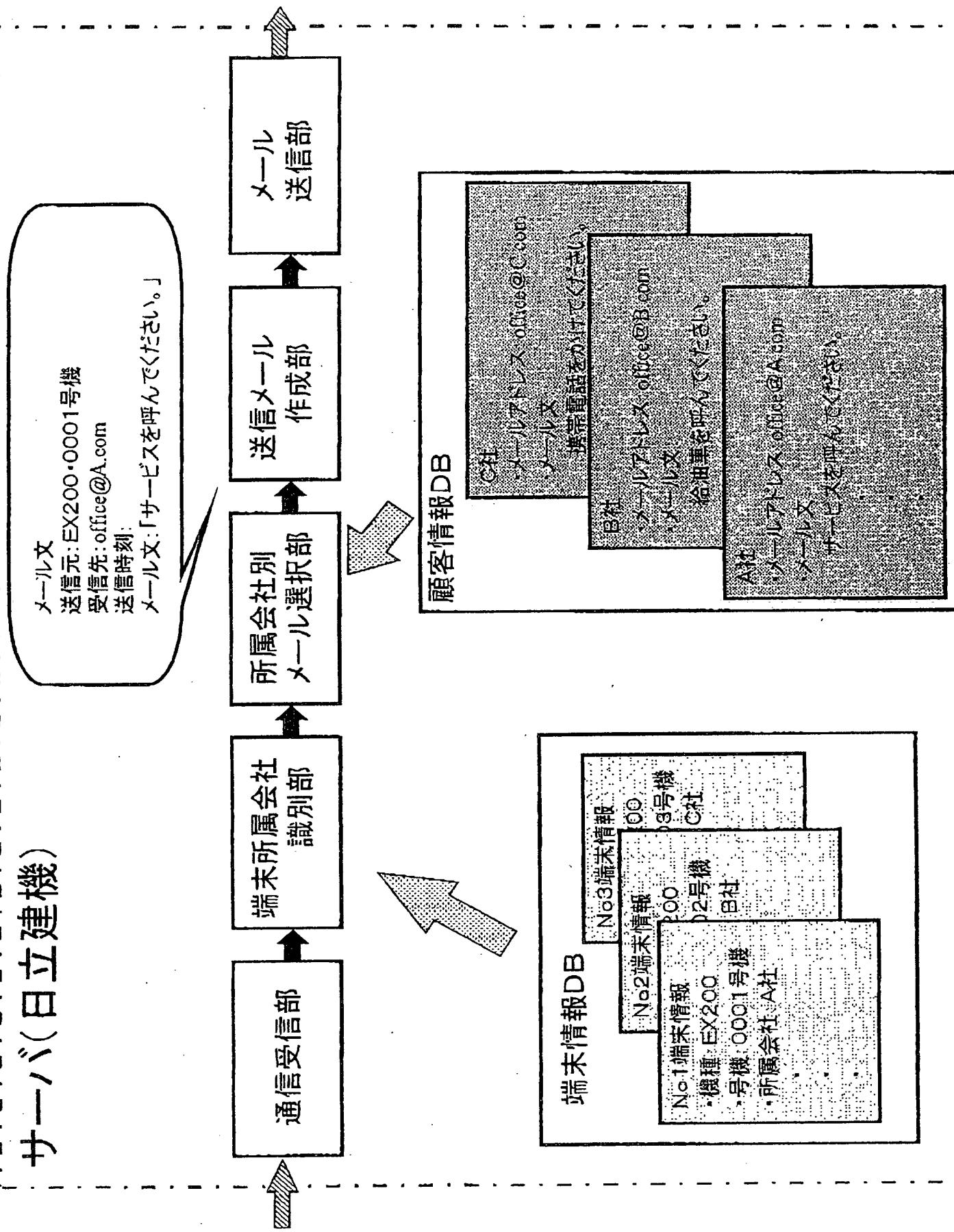
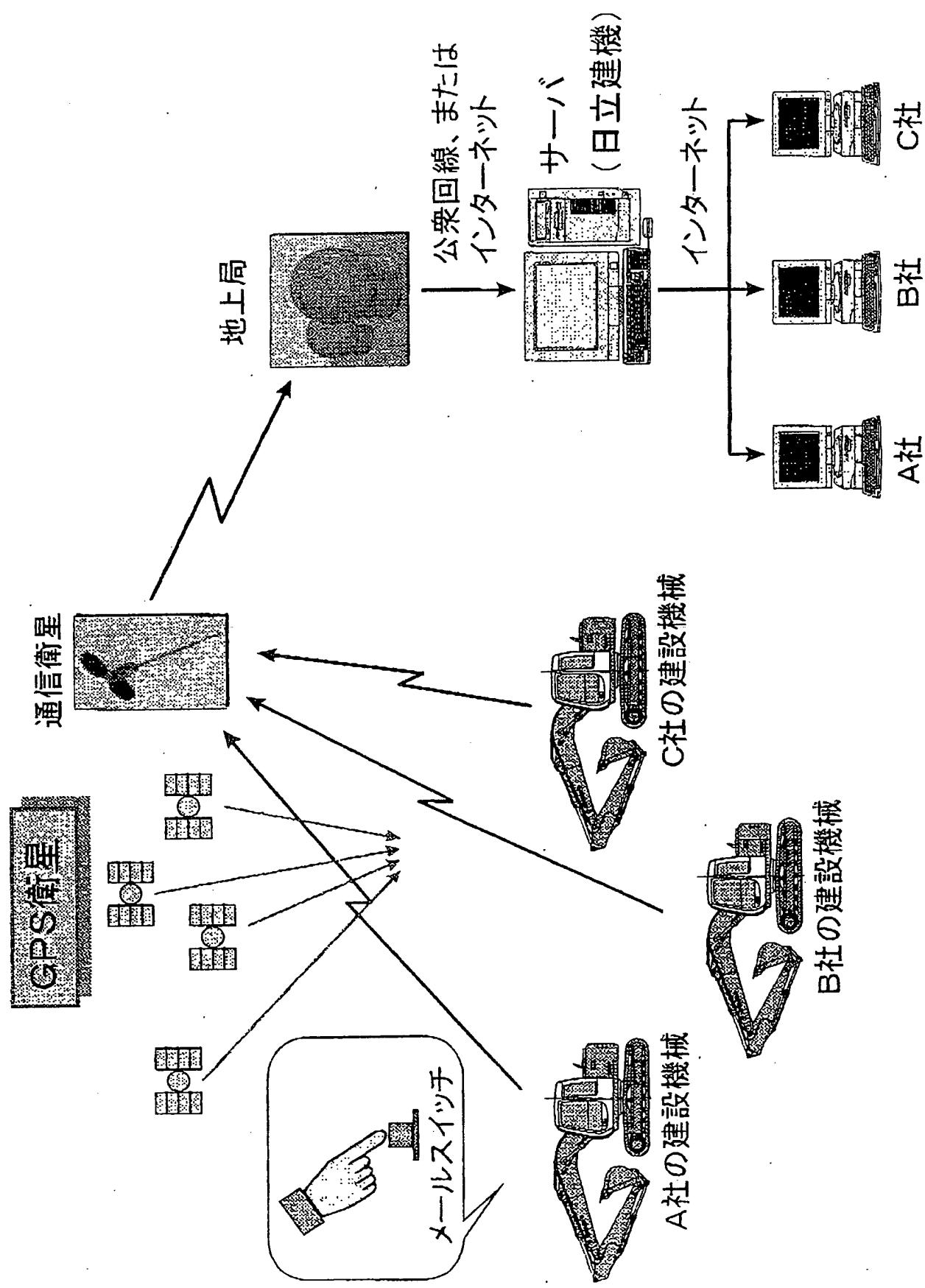


圖2 (目立機器)





サーバ(日立建機)

メール文
送信元：EX200-0001号機
受信先：office@A.com
送信時刻：
送信位置：北緯45°20'00"、東經138°30'00"
メール文：「サービスを呼んでください。」

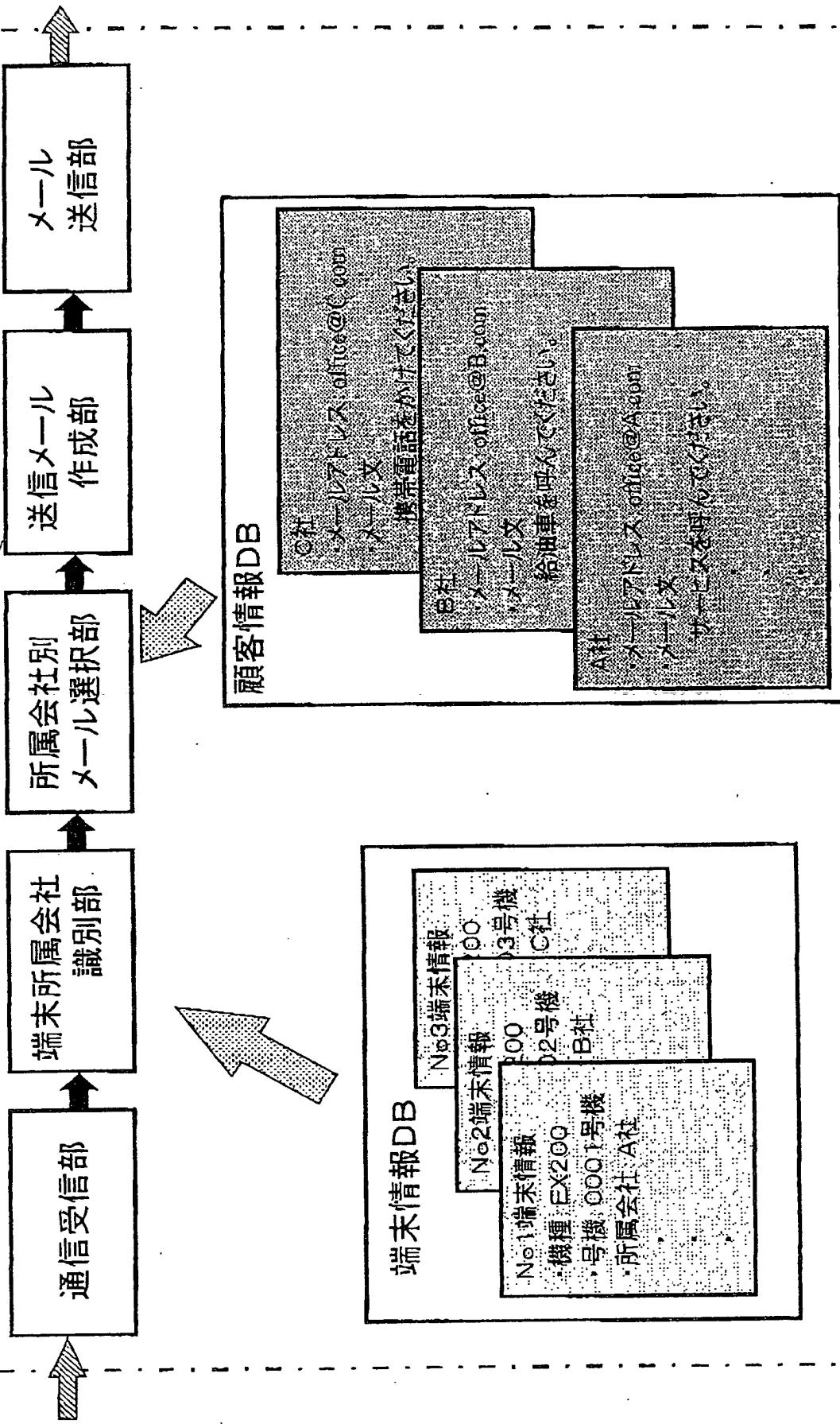
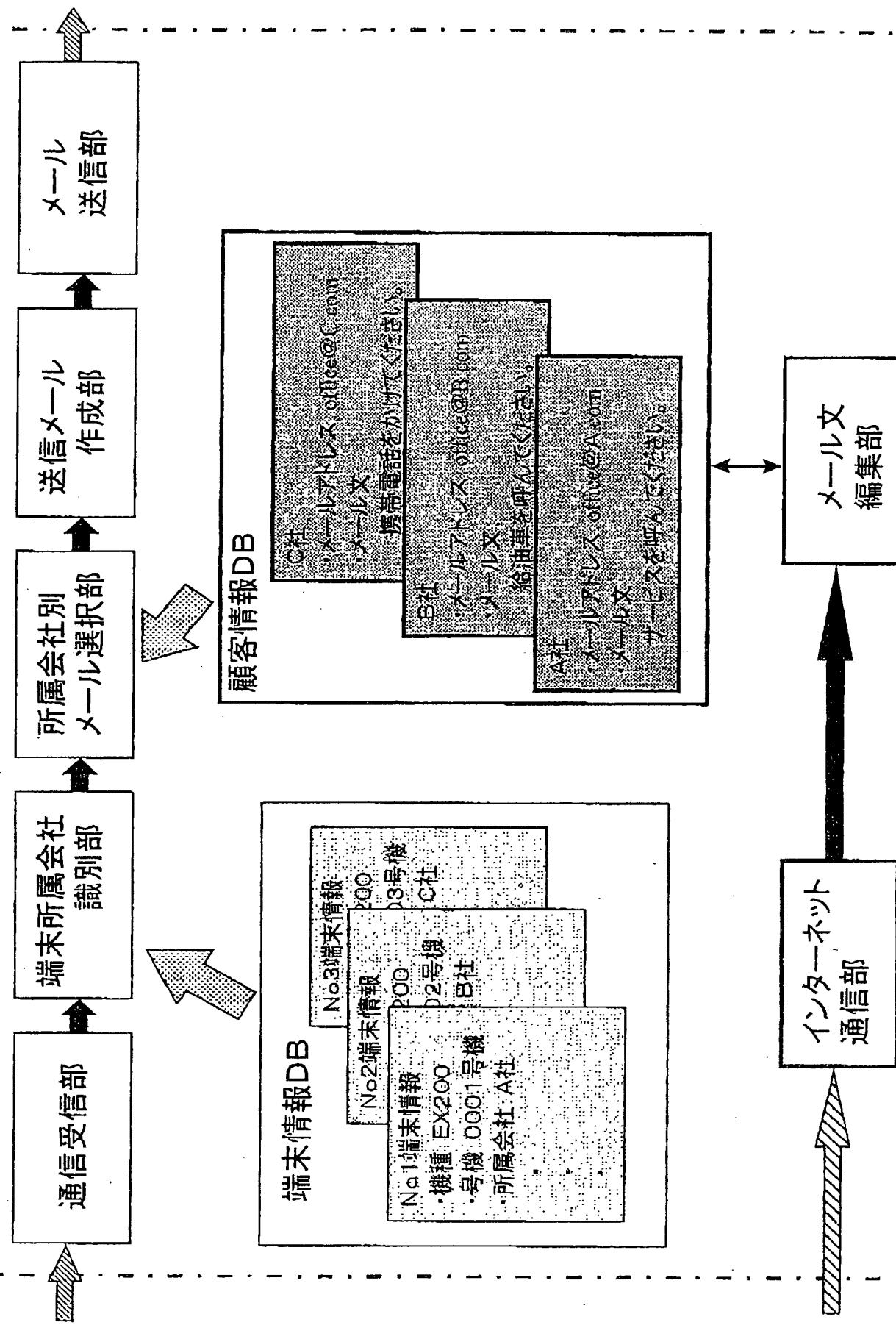
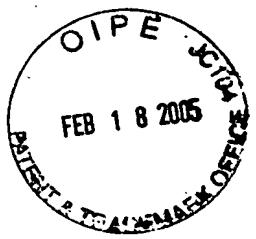


図5

サーバ(日立建機)





DECLARATION

I, Tadashi Tsukamoto of 41-8, Utsukushigaoka 3-chome, Aoba-ku, Yokohama, Kanagawa 225-0002, Japan do solemnly and sincerely declare that I well understand both Japanese and English languages.

The translation attached hereto is a true and accurate translation of the Japanese patent application as filed under Patent Application No. 2000-156925 on May 26, 2000.

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

This 17th day of February, 2005

A handwritten signature in black ink, appearing to read "Tadashi Tsukamoto".

Tadashi Tsukamoto

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【Docket No.】 K2859
【Filing Date】 May 26, 2000
【To】 Commissioner, Patent Office

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【Title of the Invention】 COMMUNICATION SYSTEM FOR WORKING MACHINES

【Number of Claims】 6

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【Name of Material】 Specification 1

【Name of Material】 Drawings 1

【Name of Material】 Abstract 1

【Need/Unneed of Proof】 Needed

【Document Name】 SPECIFICATION

【Title of the Invention】 COMMUNICATION SYSTEM FOR WORKING
MACHINES

【Claims】

【Claim 1】 A communication system for working machines, said system comprising:

 controllers arranged on said working machine, respectively, for transmitting predetermined informations from said respective working machines,

 a control station arranged at a remote location and connected to said controllers via a radiocommunication means such that said predetermined information outputted from each of said controllers is inputted in said control station, and

 a plurality of user stations connected to said control station via a network, characterized in that:

 said working machines are each provided with a transmission instructing means for instructing transmission of the corresponding predetermined information; and

 said control station is provided with an identification means for identifying from said inputted information the corresponding one of said user stations, to which said information is to be transmitted, and also with a transmission means for transmitting information, which corresponds to said inputted information, to said corresponding user station identified by said identification means.

【Claim 2】 The communication system according to claim 1, wherein said predetermined information from each of said working machines includes identification information specific to said working machine.

【Claim 3】 The communication system according to claim 2, wherein with respect to all the working machines from which informations are sent, said control station has a working machine database, and said identification means is provided with a function to identify said administration centers on a basis of the corresponding identification informations stored in said working machine database.

【Claim 4】 The communication system according to claim 3, wherein said control station has a customer database with transmission texts stored corresponding to said administration centers, and is provided with a selection means for selecting one of said transmission texts, said one transmission text corresponding to said specified administration center, from said customer database.

【Claim 5】 The communication system according to claim 4, wherein said specified administration center can rewrite, from the corresponding user station, at least said one transmission text in information stored in said customer database.

【Claim 6】 The communication system according to any one of claims 1-5, wherein said working machines are each provided with a position detecting means for detecting a current location

of said working machine, said predetermined information includes information on said location, and said information on said location is included in said information transmitted from said control station.

【Detailed Description of the Invention】

【0001】

【Field of the Invention】

This invention relates to a communication system for working machines such as hydraulic excavators, which automatically distributes predetermined information from each of the working machines to its corresponding user station via a control station arranged at a remote location.

【0002】

【Prior Art】

Conventional art of this kind includes, for example, the working machine maintenance system disclosed in JP 7-166582 A. This conventional art features that, when a communication is made from an operator of a working machine to the effect that a trouble has occurred on the working machine, data stored in a controller of the working machine are automatically transmitted to a control station via a communication means such as radiocommunication or a telephone line in accordance with an instruction from the side of the control station.

【0003】

As conventional art different from the foregoing, there

is, for example, the machine malfunction monitoring system and method disclosed in JP 11-65645 A. This conventional art features that, when a malfunction is detected during operation of a machine such as a construction machine, data of the malfunction are automatically transmitted from the machine to a monitoring station at a remote location, in other words, a control station via a communication network.

【0004】

【Problems To Be Solved by the Invention】

The above-mentioned prior art are each designed such that upon occurrence of a malfunction on a working machine such as a construction machine, data of the malfunction are automatically transmitted to a control station arranged at a remote location. Accordingly, they are effective for repair work of the malfunctioned working machine. These conventional art are, however, intended specifically for the occurrence of a malfunction, and cannot be used for the communication of a message other than the malfunction, such as a desired message corresponding to a given situation, for example, when an urgent contact with a work administration center is desired to report the completion of work or to review a schedule of work in view of the weather or the like or when it is desired to take measures in advance of occurrence of a malfunction.

【0005】

According to the above-described prior art, information

on a malfunction is sent only to a control station which is managed by the maker of the working machine, and no communication means to a user is referred to. The message relating to the above-mentioned work, however, has to be promptly transmitted to a work administration center, for example, the owner or the like of the working machine rather than the maker.

【0006】

With the foregoing problem in view, the present invention has as an object the provision of a communication system for working machines, which can communicate messages corresponding to given situations, especially desired messages to respective users from sites, where working machines are arranged, to their corresponding work administration centers at timings as needed by radiocommunication.

【0007】

【Means for the Solution of the Problems】

To achieve the above-mentioned object, the present invention is characterized in that in a communication system for working machines, said system comprising controllers arranged on the working machine, respectively, for transmitting predetermined informations from the respective working machines, a control station arranged at a remote location and connected to the controllers via a radiocommunication means such that the predetermined information outputted from each of

the controllers is inputted in the control station, and a plurality of user stations connected to the control station via a network, the working machines are each provided with a transmission instructing means for instructing transmission of the corresponding predetermined information; and the control station is provided with an identification means for identifying from the inputted information the corresponding one of the user stations, to which the information is to be transmitted, and also with a transmission means for transmitting information, which corresponds to the inputted information, to the corresponding user station identified by the identification means.

At a stage, for example, that an operator of one of the working machines has operated its transmission instructing means in the present invention constituted as described above, the predetermined information is transmitted from the corresponding controller and is then sent to the control station at the remote location via the radiocommunication means. When the thus-sent information is inputted, the control station identifies the corresponding one of the user stations, to which the information is to be transmitted, in other words, the corresponding specific user station.

Information, which corresponds to the inputted information, is then outputted from the transmission means and sent to the corresponding user station via the network.

【0008】

According to the present invention, the operator of each working machine can, therefore, send necessary information to the remote location by operating the transmission instructing means as needed. On the other hand, the inputted information is automatically sent by the control station to the corresponding user station, for example, a corresponding work administration center. Accordingly, messages corresponding to situations, especially messages desired by individual users can be independently communicated from sites, where the machines are arranged, to the corresponding work administration centers at timings as needed via the radiocommunication means.

【0009】

【Modes for Carrying Out the Invention】

The embodiments of the communication system according to the present invention for construction machines will hereinafter be described based on the drawings.

【0010】

FIG. 1 through FIG. 3 are diagrams illustrating the construction of a first embodiment of the communication system for working machines according to the present invention, FIG. 1 is a diagram showing its overall construction, FIG. 2 is a construction diagram of a communication controller mounted on a hydraulic excavator as a working machine, and FIG. 3 is a block diagram illustrating a sequence of processing in a server as

a control station.

[0011]

As illustrated in FIG. 1, a communication system according to this embodiment for working machines comprises a communication satellite 6, a ground station 2, and a server 1 as a control station, all of which are arranged to send informations, which are transmitted from plural working machines, for example, hydraulic excavators 7,8,9, to their corresponding user stations 3,4,5. When information is inputted to the server 1, the server 1 performs processing as will be described subsequently herein, and then sends the information in the form of e-mail to one of the plural user stations 3,4,5 connected to the server 1 via a network, said one user station corresponding to the above-mentioned one of the hydraulic excavators. Here, the ground station 2 and the server 1 are connected with each other via a public line, such as a telephone line, or internet 11, while the server 1 and the user stations 3,4,5 are connected with each other via an internet 12. As shown in FIG. 2, the hydraulic excavators 7,8,9 are each provided with a communication controller 23 and a mail switch 10 as a communication instructing means for instructing transmission of information.

As illustrated in FIG. 3, on the other hand, the server 1 which controls input, output and the like of information sent from the hydraulic excavators 7,8,9 is provided with a

communication receiving unit 13; a terminal user-company identification unit 14 as identification means for identifying, from the inputted informations, user companies of the hydraulic excavators 7,8,9 as user stations to which the informations are to be transmitted, respectively; a user-company-dependent mail selection unit 15 as a selection means for selecting one of mail messages registered corresponding to the individual user companies; a transmission mail creation unit 16 for creating a mail to be transmitted; and a mail transmission unit 17 as a transmitting means for transmitting the thus-created mail. The server 1 is also provided with a terminal information database 18 and a customer information database 19. In the terminal information database 18, the model names, excavator numbers and user companies of the individual hydraulic excavators 7,8,9 are stored in combination as terminal informations 18a,18b,18c. In the customer information database 19, mail addresses and mail texts are stored in combination as customer informations 19a,19b,19c separately depending upon the user companies. The mail texts stored in the customer informations 19a,19b,19c can be set with contents as desired by the individual customers. By way of example, these mail texts are set as "please call a service man" for Company A, "please call a tank lorry" for Company B, and "please telephone to my cellular phone" for Company C.

【0012】

In the first embodiment constructed as described above, operation of the mail switch 10 by an operator of the hydraulic excavator 7 owned by Company A results in production of information specific to the hydraulic excavator 7, including its excavator number, at the controller 23, followed by the transmission of the information. The information transmitted from the hydraulic excavator 7 is sent as radio signals to the ground station 2 via a communication satellite 6. From the ground station 2, the information is sent to the server 1 via the public line 11.

【0013】

In the server 1, it is confirmed at the communication receiving unit 13 whether or not the information has been transmitted.

【0014】

When the information has been received, the terminal user-company identification unit 14 identifies the corresponding user station, to which the information is to be transmitted, based on the transmitted information. As mentioned above, the information from the hydraulic excavator 7 includes the excavator number as specific identification information. The terminal user-company identification unit reads data corresponding to the excavator number, for example, No. 1 terminal information 18a from the terminal information database 18, and identifies the user company, Company A, which

is stored together with the number and model name of the excavator.

【0015】

After the user company, Company A, has been identified, the user-company-dependent mail selection unit 15 selects the customer information 19a on the use company, Company A, from the customer information database 19.

【0016】

In the customer information 19a, the mail address of Company A and the mail text "please call a serviceman" are stored. The transmission mail creation unit 16 creates a new message 16a, which contains the model name and number of the hydraulic excavator 7 as a sender, the mail address of Company A as the receiver, the date and time of transmission, and the mail text. As the date and time of transmission, the date and time of receipt of the mail by the server 1 from the hydraulic excavator 7 is desired from the viewpoint of communication cost and the like. As an alternative, the controller 23 may also be designed to produce and output signals indicative of the date and time along with the number of the hydraulic excavator 7 at a stage that the mail switch 10 of the hydraulic excavator 7 has been operated.

【0017】

Subsequent to the creation of the new message 16a, the mail transmission unit 17 transmits the mail so that the mail

is sent to the user station 3 of Company A via the internet 12. Therefore, the information from the operator of the hydraulic excavator 7 can be immediately read at Company A.

【0018】

According to the first embodiment, when the operator of any one of the hydraulic excavators 7, 8, 9 simply operates the mail switch 10 as needed, a new message of predetermined content is automatically created and is immediately delivered, for example, to the user company of the hydraulic excavator 7, 8 or 9 as described above. At the user company, a measure can hence be taken in response to the communicated information without delay.

【0019】

In the above-described first embodiment, the individual processing in the server 1 were described to be performed by the corresponding single-purpose means. As illustrated in FIG. 4, however, these processing may be performed as software-dependent processing. Described specifically, when the server 1 receives the information from the hydraulic excavator 7 in step S1, the received information is read in step S2. In step S3, a user company is identified from the terminal information database 18 on the basis of the information read in step S2. In step S4, a mail text corresponding to the user company is subsequently read from the customer database 19. A new message is created in the next step S5, and is then transmitted in step

S6.

【0020】

Based on FIGS. 5 and 6, a description will next be made about the second embodiment of the present invention.

【0021】

The second embodiment corresponds especially to claim 6. FIG. 5 is a diagram showing the construction of a communication system construction according to a second embodiment of the present invention for a working machine, and FIG. 6 is a block diagram illustrating a sequence of processing by a server as a control station.

【0022】

The hydraulic excavators 7, 8, 9 in the second embodiment are each provided with a position detecting means for receiving signals from GPS satellites 30 to detect its position. The remaining structure is constructed in a similar way as in the above-described first embodiment.

【0023】

When the operator of the hydraulic excavator 7 owned by Company A, for example, operates the mail switch 10 in the second embodiment constructed as described above, the controller 23 reads signals from the GPS satellites 20 and calculates the current position of the hydraulic excavator 7 on the basis of the signals. Information, which includes the excavator number specific to the hydraulic excavator 7 and information on its

position, is then produced at the controller 23, and the information is transmitted.

【0024】

The server 1 performs substantially the same processing as in the above-described first embodiment. At a transmission mail creation unit 16, however, a new message of such content as including information on the position of the hydraulic excavator 7 is created as shown at a new message 16b.

【0025】

In addition to the advantageous effect available from the above-described first embodiment, the second embodiment thus allows the user company to determine the current position of the hydraulic excavator 7 from which the information was transmitted, thereby making it possible to take a measure in response to the transmitted information more promptly without delay.

【0026】

Based on FIG 7, a description will next be made about the third embodiment of the present invention.

【0027】

The third embodiment corresponds especially to claim 5. FIG. 7 is a block diagram illustrating a sequence of processing by a server as a control station.

【0028】

A server 1 in the third embodiment is provided with an

internet communication unit 21 and a mail text editing unit 22, both of which are arranged to permit rewriting of the contents of the mail texts described in the customer information database 19 from the side of the user stations 3,4,5. The remaining structure is constructed in a similar way as in the above-described first embodiment.

【0029】

In the third embodiment constructed as described above, Company B, for example, accesses to the customer information database 19 from the user station 4 via the internet 12, the internet communication unit 21 and the mail text editing unit 22, and reads the customer information 19b on Company B. The mail text editing unit 22 rewrites the mail text from "please call a tank lorry" to, for example, "today's work has been finished", and the mail text of the rewritten content is stored as customer information 19b.

【0030】

In addition to the advantageous effect available from the above-described first embodiment, the third embodiment hence allows each user company to rewrite the mail text into a mail text corresponding to the details of work or the frequency of transmissions of a message, thereby making it possible to efficiently take a measure in response to the communicated information.

【0031】

The above embodiments were described by providing each hydraulic excavator as a working machine with one mail switch 10 and storing only one mail text as a mail text to be communicated per user company. However, each hydraulic excavator may be provided, for example, with plural mail switches 10, and mail texts corresponding to the individual mail switches may be stored in the customer information database such that the mail text of the content corresponding to operated one of the mail switches can be sent to the user company.

【0032】

【Advantageous Effects of the Invention】

According to the present invention embodiment as defined in claims 1-4, when an operator of any one of working machines simply operates its transmission instructing means as needed, a preset message is sent to the corresponding user company as described above. The user company can, therefore, take a measure in response to the communicated information without delay.

【0033】

According to the present invention as defined in claim 6, the user company to which the information has been transmitted can also determine the current position of the working machine from which the information was transmitted, thereby making it possible to take a measure in response to the communicated information more promptly without delay.

【0034】

According to the present invention as defined in claim 5, an administration center can rewrite a message as desired corresponding to the details of work or the frequency of transmissions of the message, thereby making it possible to efficiently take a measure in response to the communicated information.

【Brief Description of the Drawings】

【FIG. 1】

FIG. 1 is an overall construction diagram in a first embodiment of the present invention.

【FIG. 2】

FIG. 2 is a construction diagram of a communication controller mounted on a hydraulic excavator.

【FIG. 3】

FIG. 3 is a block diagram illustrating a sequence of processing by a server in the first embodiment of the present invention.

【FIG. 4】

FIG. 4 is a flow chart of the sequence of processing in the server in the first embodiment as replaced by software-dependent processing.

【FIG. 5】

FIG. 5 is an overall construction diagram in a second embodiment of the present invention.

【FIG. 6】

FIG. 6 is a block diagram illustrating a sequence of processing by a server in the second embodiment of the present invention.

【FIG. 7】

FIG. 7 is a block diagram illustrating a sequence of processing by a server in a third embodiment of the present invention.

【Legend】

- 1 Server (control station)
- 3 User station
- 4 User station
- 5 User station
- 6 Communication satellite
- 7 Construction machine (working machine)
- 10 Mail switch (transmission instructing means)

COMMUNICATION SATELLITE

FIG. 1

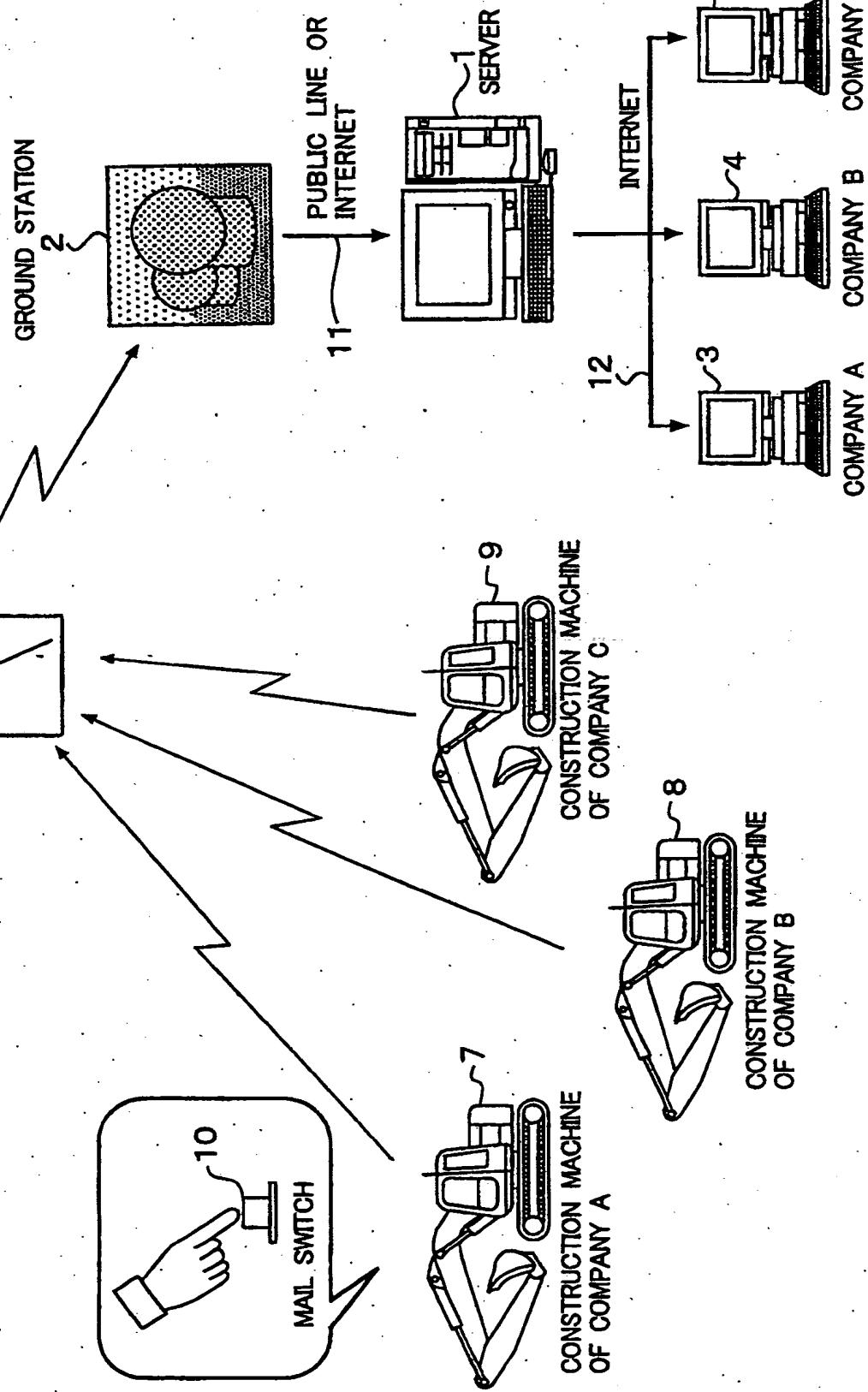
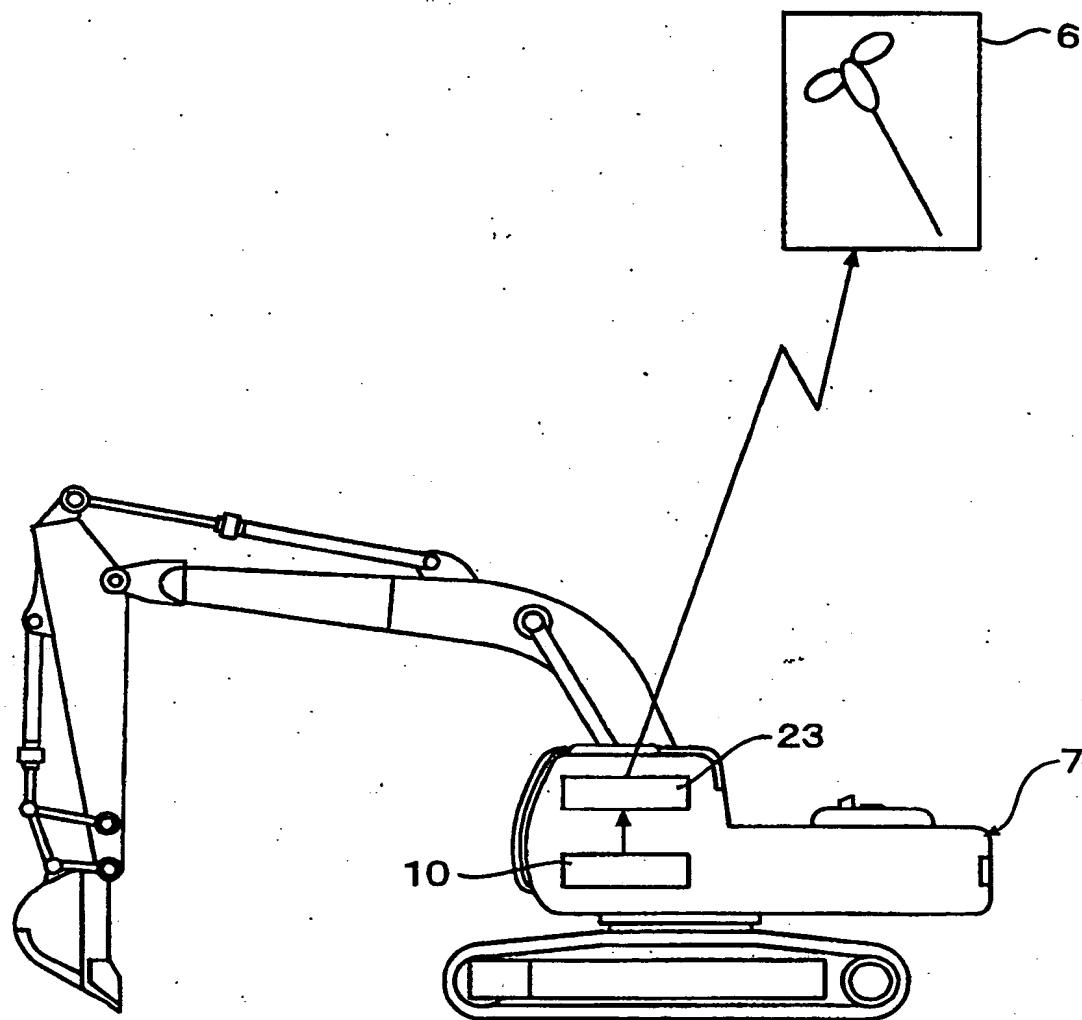


FIG. 2



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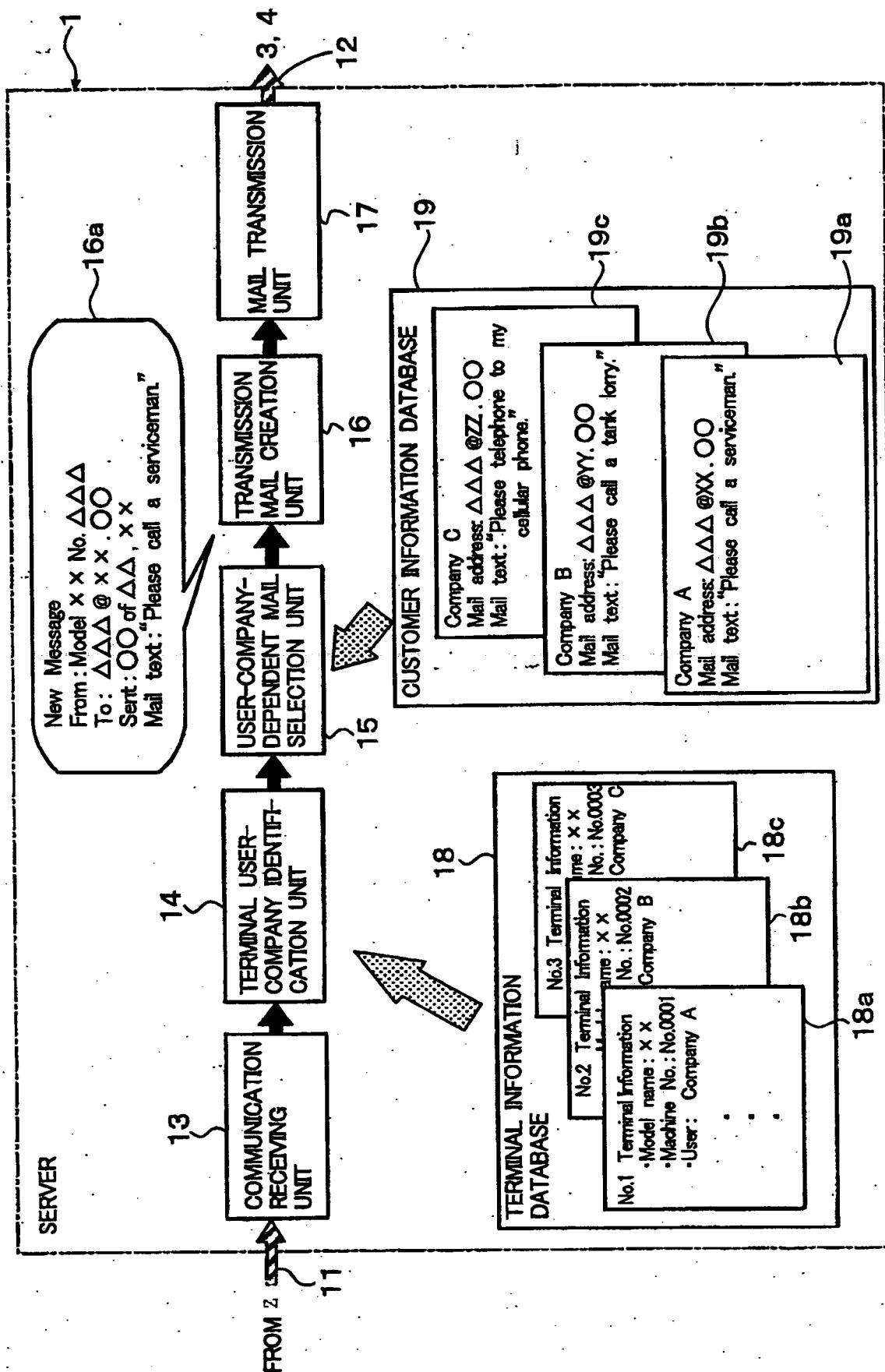


FIG. 4

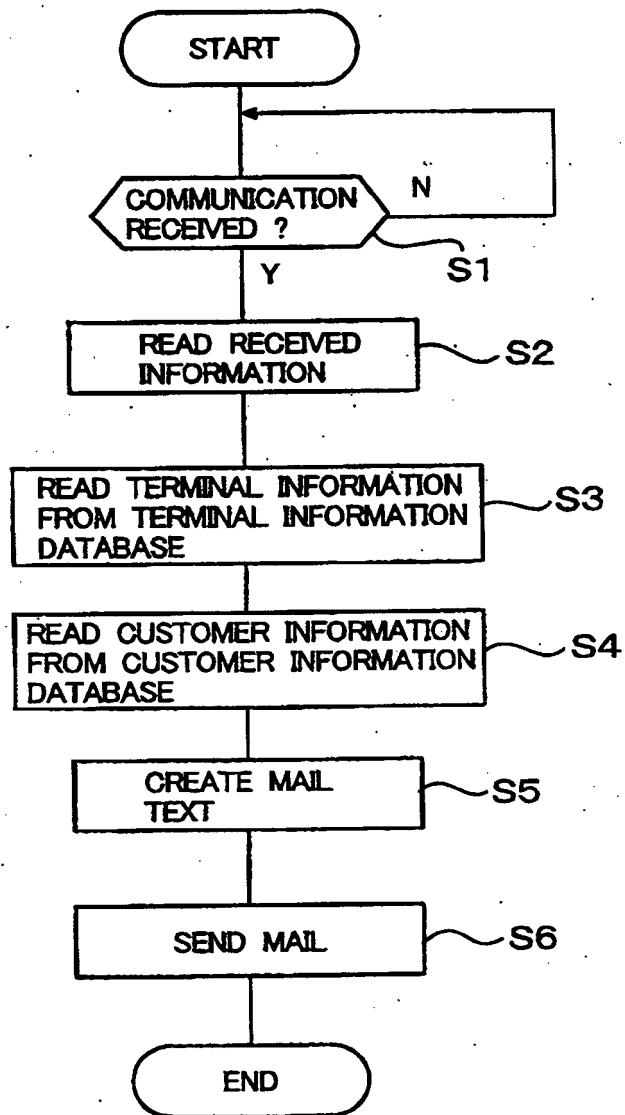


FIG. 5

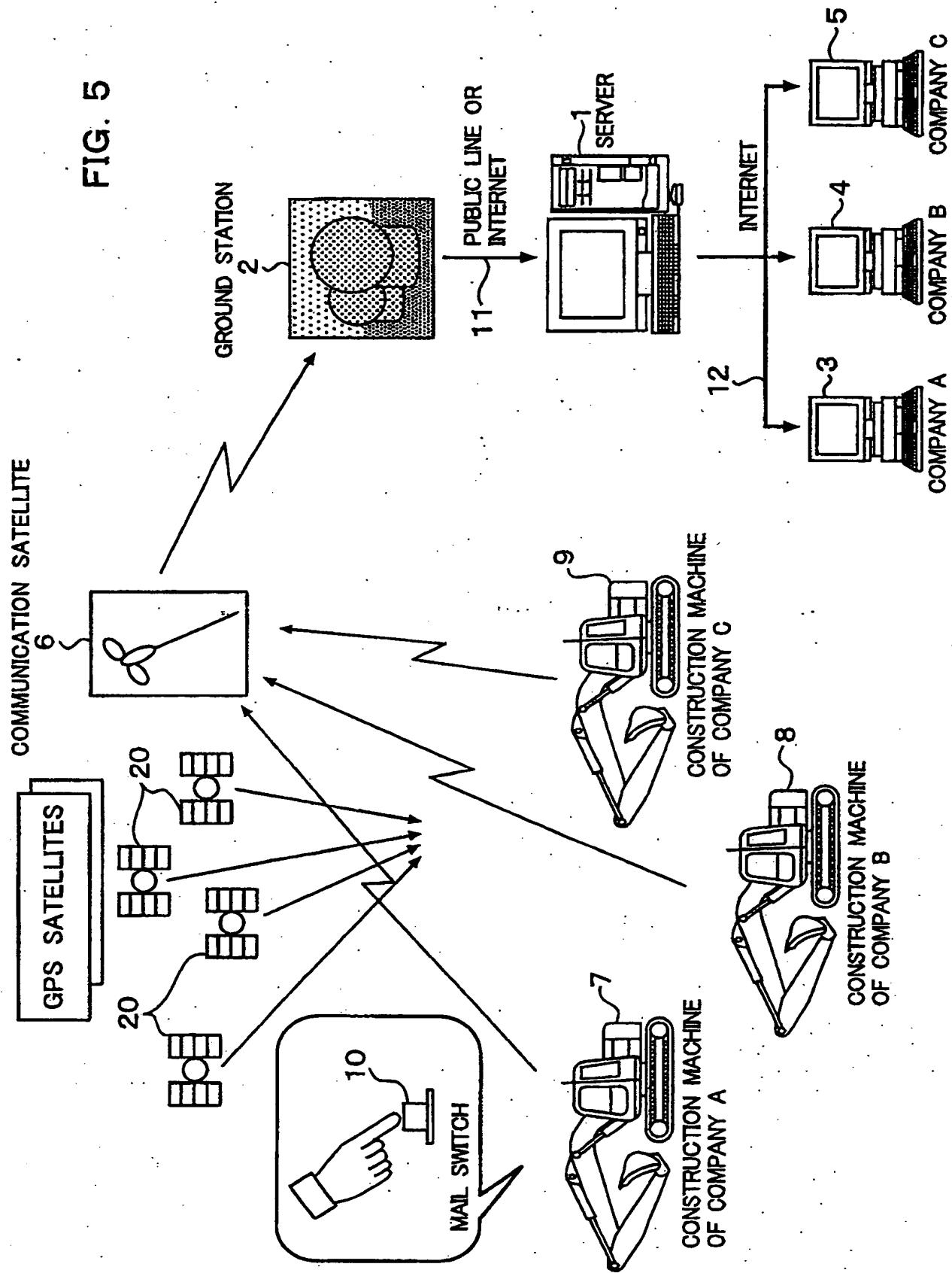


FIG. 6

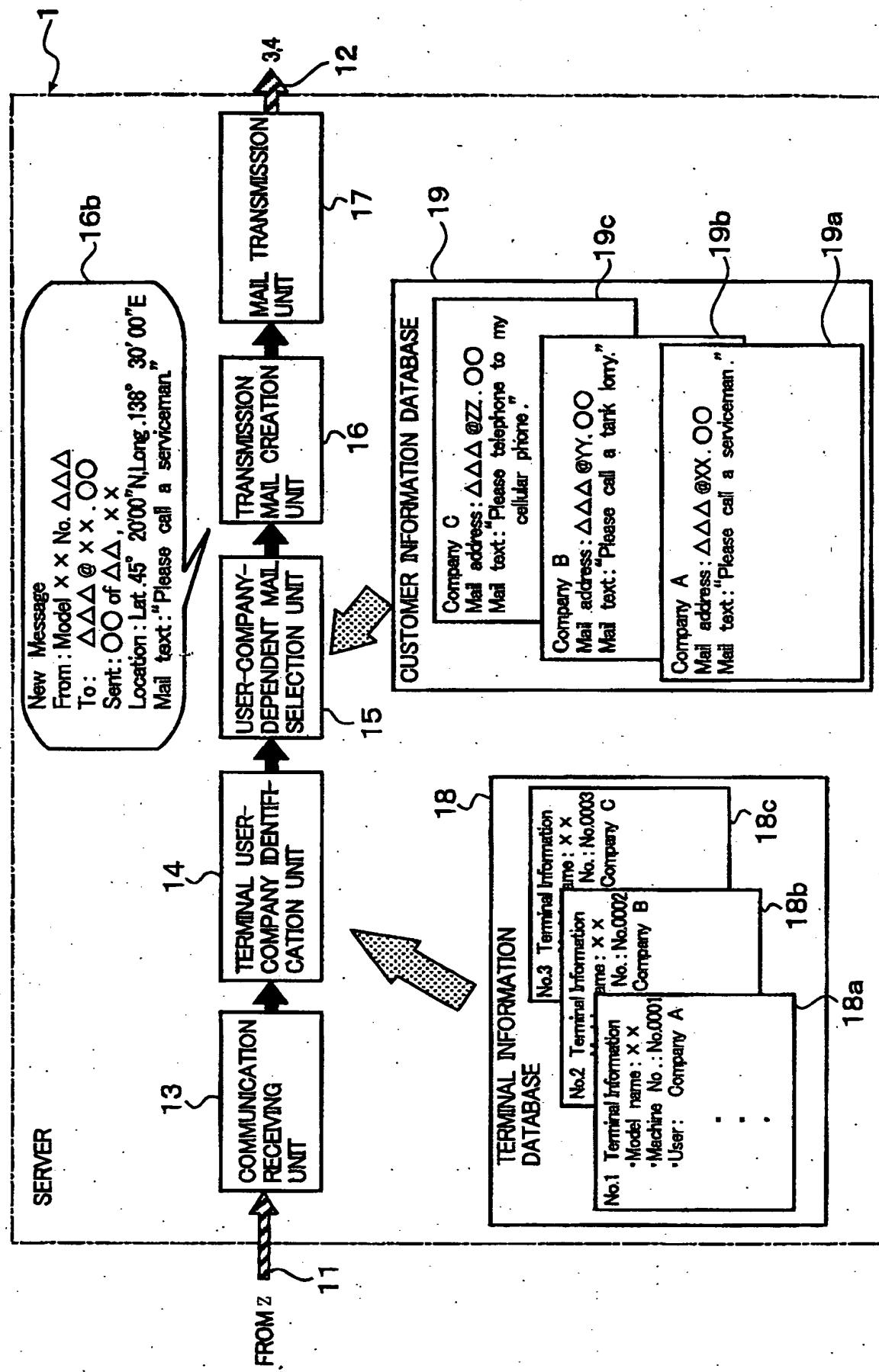
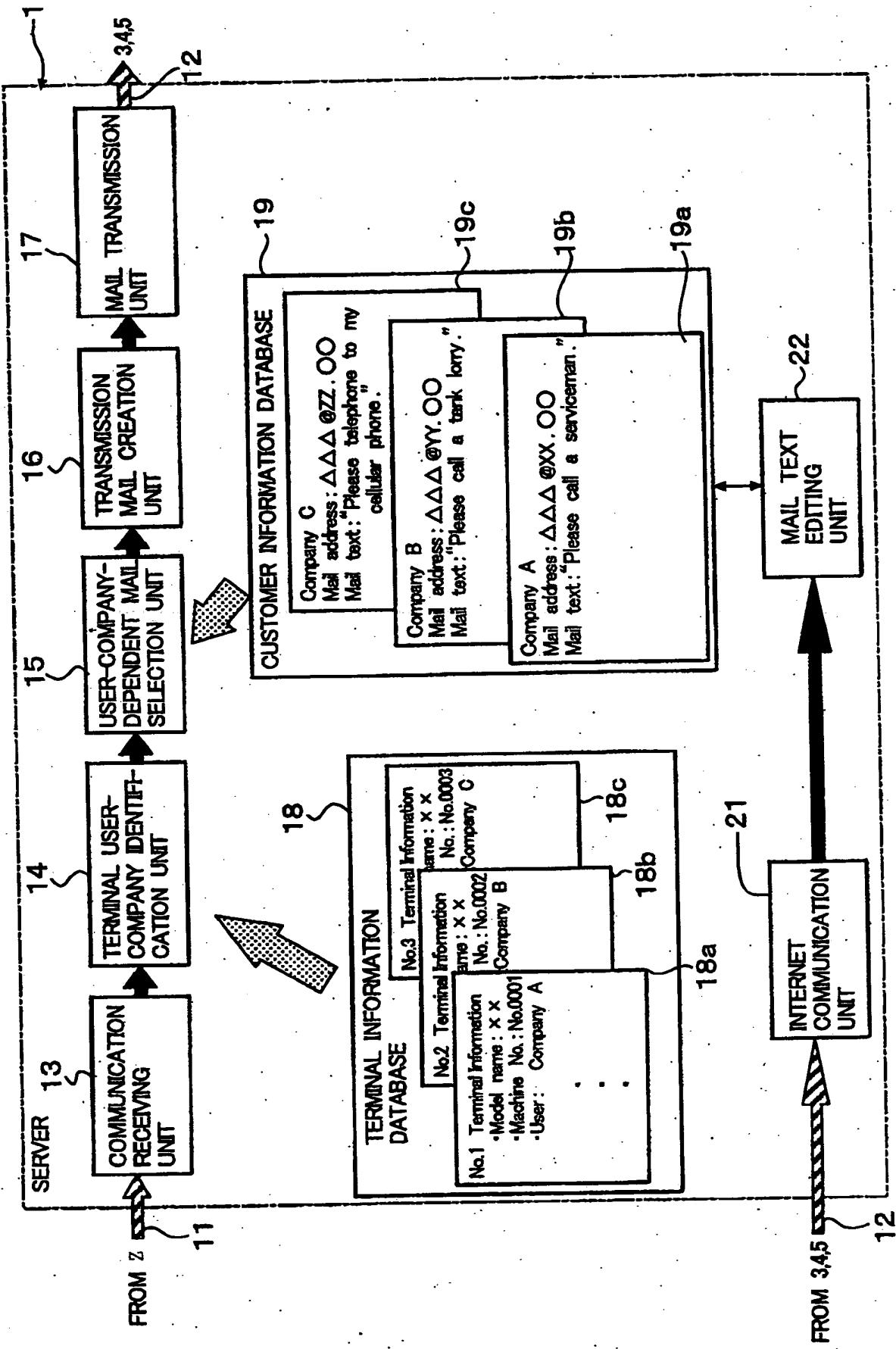


FIG. 7



【Document Name】 ABSTRACT

【Abstract】

【Object】 To provide a communication system for working machines, which makes it possible to transmit desired messages from sites, where the working machines are arranged, to their corresponding work administration centers at timings as needed.

【Constitution】 When a mail switch 10 arranged on a working machine 7 is operated to send information to a server 1, a terminal user-company identification unit 14 identifies, on the basis of a terminal information database 18, a user to which the information so received is to be sent. A user-company-dependent mail selection unit 15 selects customer information 19a on the user from a customer database 19. At a transmission mail creation unit 16, a corresponding new message 16a is created. The mail is then transmitted from a mail output unit 17. In this manner, a desired message can be sent from each working machine 7 at a remote location to the corresponding user at a timing as needed.

【Selected Figure of Drawings】 FIGURE 3

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